CLAIMS

WHAT IS CLAIMED IS:

1. A molecular delivery vehicle for delivery of therapeutic, diagnostic, or research compounds to a target, comprising:
   (a) a carrier for carrying said compounds;
   (b) an adapter covalently linked to said carrier; and
   (c) a targeting protein comprising a recognition portion and a targeting portion, said recognition portion capable of binding to said adapter, said targeting portion capable of binding to said target.

2. The molecular delivery vehicle of claim 1, wherein said target is attached to a natural or artificial surface.

3. The molecular delivery vehicle of claim 1, wherein said target is a cell surface receptor or a cell surface antigen.

4. The molecular delivery vehicle of claim 1, wherein said adapter functions as said target.

5. The molecular delivery vehicle of claim 1, wherein said carrier comprises a polymer.

6. The molecular delivery vehicle of claim 1, wherein said carrier is selected from the group consisting of polysaccharides, polylysine, polyethylenimine, poly(vinyl alcohol), poly(divinyl) ether-*co*-maleic anhydrdride, poly(ethylene glycol), poly(methyl methacrylates), polyanhydrides, polyesters, polyacrylic acids, polyurethanes,N-(2-hydroxypropyl)methacrylamide, derivatized polyethylenglycoles, co-polymers and derivatized co-polymers, liposomes and derivatized liposomes, dendrimers and derivatized dendrimers, viral and bacteriophage particles, bids, nanoparticles, and combinations thereof.

7. The molecular delivery vehicle of claim 1, wherein said therapeutic, diagnostic, or research compounds are selected from the group consisting of nucleic acids, peptides, proteins, viruses, viral particles employed for gene delivery, chemotherapeutic agents, paramagnetic agents, radioactive agents, fluorogenic agents, and combinations thereof.

8. The molecular delivery vehicle of claim 1, wherein said adapter is selected from the group consisting of a wild type or mutant S-protein fragment of bovine or human ribonuclease A, cellulose, calmodulin, and streptavidin.

9. The molecular delivery vehicle of claim 1, wherein said targeting portion of said targeting protein is selected from the group consisting of cytokines, growth factors, peptide hormones, antibodies, fusion proteins, and combinations thereof.

10. The molecular delivery vehicle of claim 1, wherein said targeting portion of said targeting protein is vascular endothelial growth factor 121.

11. The molecular delivery vehicle of claim 1, wherein said recognition portion of said targeting protein is an S-peptide fragment of bovine or human ribonuclease A.

12. The molecular delivery vehicle of claim 1, wherein said recognition portion of said targeting protein is located at the N-terminus of said targeting protein.

13. The molecular delivery vehicle of claim 1, wherein said target is a receptor found on a cell selected from the group consisting of cells expressing receptors for vascular endothelial growth factor.

14. The molecular delivery vehicle of claim 1, wherein said targeting protein further comprises a spacer peptide positioned between said recognition portion and said targeting portion.

15. A pharmaceutical composition, comprising:

(1) a pharmaceutically acceptable carrier; and

(2) a pharmaceutically effective amount of a molecular delivery vehicle for delivery of therapeutic, diagnostic, or research compounds to a target, comprising:

(a) a carrier for carrying said compounds;

(b) an adapter covalently linked to said carrier; and

(c) a targeting protein comprising a recognition portion and a targeting portion, said recognition portion capable of binding to said adapter, said targeting portion capable of binding to said target.

16. The pharmaceutical composition of claim 15, wherein said target is attached to a natural or artificial surface.

17. The pharmaceutical composition of claim 15, wherein said target is a cell surface receptor or a cell surface antigen.

18. The pharmaceutical composition of claim 15, wherein said adapter functions as said target.

19. The pharmaceutical composition of claim 15, wherein said carrier comprises a polymer.

20. The pharmaceutical composition of claim 15, wherein said carrier is selected from the group consisting of polysaccharides, polylysine, polyethylenimine, poly(vinyl alcohol), poly(divinyl) ether-*co*-maleic anhydrdride, poly(ethylene glycol), poly(methyl methacrylates), polyanhydrides, polyesters, polyacrylic acids, polyurethanes,N-(2-hydroxypropyl)methacrylamide, derivatized polyethylenglycols, co-polymers and derivatized co-polymers, liposomes and derivatized liposomes, dendrimers and derivatized dendrimers, viral and bacteriophage particles, bids, nanoparticles, and combinations thereof.

21. The pharmaceutical composition of claim 15, wherein said therapeutic, diagnostic, or research compounds are selected from the group consisting of nucleic acids, peptides, proteins, viruses, viral particles employed for gene delivery, chemotherapeutic agents, paramagnetic agents, radioactive agents, fluorogenic agents, and combinations thereof.

22. The pharmaceutical composition of claim 15, wherein said adapter is selected from the group consisting of a wild-type or mutant S-protein fragment of bovine or human ribonuclease A, cellulose, calmodulin, and streptavidin.

23. The pharmaceutical composition of claim 15, wherein said targeting portion of said targeting protein is selected from the group consisting of cytokines, growth factors, peptide hormones, antibodies, f usion proteins, and combinations thereof.

24. The pharmaceutical composition of claim 18, wherein said targeting portion of said targeting protein is vascular endothelial growth factor 121.

25. The pharmaceutical composition of claim 15, wherein said recognition portion of said targeting protein is an S-peptide fragment of bovine or human ribonuclease A.

26. The pharmaceutical composition of claim 15, wherein said recognition portion of said targeting protein is located at the N-terminus of said targeting protein.

27. The pharmaceutical composition of claim 15, wherein said target is a receptor found on a cell selected from the group consisting of cells expressing receptors for vascular endothelial growth factor.

28. The pharmaceutical composition of claim 15, wherein said targeting protein further comprises a spacer peptide positioned between said recognition portion and said targeting portion.

29. The pharmaceutical composition of claim 15, wherein said pharmaceutically acceptable carrier is selected from the group consisting of water, gelatin, lactose, starch, magnesium stearate, talc, plant oils, gums, alcohol, petroleum jelly, buffered saline, and combinations thereof.

30. An article of manufacture comprising packaging material and a pharmaceutical agent contained within said packaging material, wherein said pharmaceutical agent is therapeutically effective for treating pathophysiological conditions that depend on cells that can be detected or affected via target-mediated delivery of therapeutic or diagnostic compounds and wherein said packaging material comprises a label which indicates that the pharmaceutical agent can be used for treating pathophysiological conditions that depend on cells that can be detected or affected via target-mediated delivery of therapeutic or diagnostic compounds, and wherein said pharmaceutical agent comprises a pharmaceutically effective amount of a molecular delivery vehicle for delivery of therapeutic, diagnostic, or research compounds to a target, comprising:

(a) a carrier for carrying said compounds;

(b) an adapter covalently linked to said carrier; and

(c) a targeting protein comprising a recognition portion and a targeting portion, said recognition portion capable of binding to said adapter, said targeting portion capable of binding to said target;

in a pharmaceutically acceptable carrier.

31. A method for delivering therapeutic, diagnostic, or research compounds to a target, comprising the step of:

administering a pharmaceutical composition comprising:

(1) a pharmaceutically acceptable carrier; and

(2) a pharmaceutically effective amount of a molecular delivery vehicle for delivery of compounds to a target, comprising:

(a) a carrier for carrying said compounds;

(b) an adapter covalently linked to said carrier; and

(c) a targeting protein comprising a recognition portion and a targeting portion, said recognition portion capable of binding to said adapter, said targeting portion capable of binding to said target.

32. The method of claim 31, wherein said target is attached to a natural or artificial surface.

33. The method of claim 31, wherein said target is a target is a cell surface receptor or a cell surface antigen.

34. The method of claim 31, wherein said adapter functions as said target.

35. The method of claim 31, wherein said carrier comprises a polymer.

36. The method of claim 31, wherein said carrier is selected from the group consisting of polysaccharides, polylysine, polyethylenimine, poly(vinyl alcohol), poly(divinyl) ether-*co*-maleic anhydrdride, poly(ethylene glycol), poly(methyl methacrylates), polyanhydrides, polyesters, polyacrylic acids, polyurethanes,N-(2-hydroxypropyl)methacrylamide, derivatized polyethylenglycols, co-polymers, derivatized co-polymers, liposomes and derivatized liposomes, dendrimers and derivatized dendrimers, viral and bacteriophage particles, bids, nanoparticles, and combinations thereof.

37. The method of claim 31, wherein said therapeutic, diagnostic, or research compounds are selected from the group consisting of nucleic acids, peptides, proteins, viruses, viral particles employed for gene delivery, chemotherapeutic agents, paramagnetic agents, radioactive agents, fluorogenic agents, and combinations thereof.

38. The method of claim 31, wherein said adapter is selected from the group consisting of wild-type or mutant S-protein fragment of bovine or human ribonuclease A, cellulose, calmodulin, and streptavidin.

39. The method of claim 31, wherein said targeting portion of said targeting protein is selected from the group consisting of cytokines, growth factors, peptide hormones, antibodies, fusion proteins, and combinations thereof.

40. The method of claim 31, wherein said targeting portion of said targeting protein is vascular endothelial growth factor 121.

41. The method of claim 31, wherein said recognition portion of said targeting protein is an S-peptide fragment of bovine or human ribonuclease A.

42. The method of claim 31, wherein said recognition portion of said targeting protein is located at the N-terminus of said targeting protein.

43. The method of claim 31, wherein said target is a receptor found on a cell selected from the group consisting cells expressing receptors for vascular endothelial growth factor.

44. The method of claim 31, wherein said targeting protein further comprises a spacer peptide positioned between said recognition portion and said targeting portion.

45. The method of claim 31, wherein said pharmaceutically acceptable carrier is selected from the group consisting of water, gelatin, lactose, starch, magnesium stearate, talc, plant oils, gums, alcohol, petroleum jelly, buffered saline, and combinations thereof.

46. An isolated nucleic acid sequence, comprising (i) a first nucleic acid sequence segment encoding an S-peptide, and (ii) a second nucleic acid sequence segment encoding a full-length or mutated isoform of human vascular endothelial growth factor (VEGF), wherein said isolated nucleic acid sequence codes for a fusion protein which specifically binds to receptors for vascular endothelial growth factor recognized by the polypeptide encoded by said second nucleic acid sequence segment.

47. An isolated polypeptide encoded by the isolated nucleic acid sequence of claim 46.

48. An expression vector, comprising control elements operably linked to the nucleic acid sequence of claim 46.

49. A transformed bacterial cell containing the expression vector of claim 48.

50. Isolated nucleic acid sequences encoding wild-type and mutant human and bovine S-proteins.

51. The polypeptides encoded by the isolated nucleic acid sequences of claim 50.

52. Expression vectors, comprising control elements operably linked to the nucleic acid sequences of claim 50.

53. Transformed bacterial cells containing the expression vectors of claim 52.

54. An isolated nucleic acid sequence, comprising (i) a first nucleic acid sequence segment encoding S-protein, and (ii) a second nucleic acid sequence encoding a full-length or mutated isoform of human vascular endothelial growth factor (VEGF), wherein said isolated nucleic acid sequence codes for a fusion protein which specifically binds to receptors for vascular endothelial growth factor recognized by the polypeptide encoded by said second nucleic acid sequence segment.

55. An isolated polypeptide encoded by the isolated nucleic acid sequence of claim 54.

56. An expression vector, comprising control elements operably linked to the nucleic acid sequence of claim 54.

57. A transformed bacterial cell containing the expression vector of claim 56.